



NIPBL gene

NIPBL, cohesin loading factor

Normal Function

The *NIPBL* gene provides instructions for making a protein called delangin, which plays an important role in human development. Before birth, delangin is found in the developing arms and legs, the bones of the skull and face, the spinal column, the heart, and other parts of the body.

Delangin helps control the activity of chromosomes during cell division. Before cells divide, they must copy all of their chromosomes. The copied DNA from each chromosome is arranged into two identical structures, called sister chromatids. The sister chromatids are attached to one another during the early stages of cell division by a group of proteins known as the cohesin complex. Delangin plays a critical role in the regulation of this complex. Specifically, it controls the interaction between the cohesion complex and the DNA that makes up the sister chromatids.

Researchers believe that delangin, as a regulator of the cohesin complex, also plays important roles in stabilizing cells' genetic information, repairing damaged DNA, and controlling the activity of certain genes that are essential for normal development.

Health Conditions Related to Genetic Changes

Cornelia de Lange syndrome

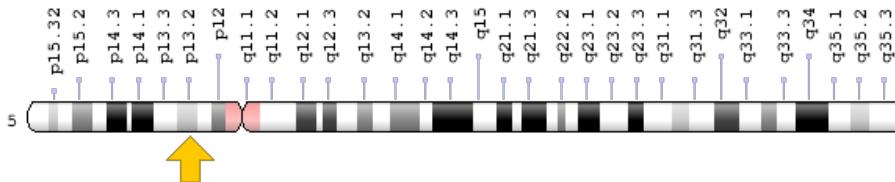
More than 300 mutations in the *NIPBL* gene have been identified in people with Cornelia de Lange syndrome, a developmental disorder that affects many parts of the body. Mutations in this gene are the most common known cause of Cornelia de Lange syndrome, accounting for more than half of all cases.

Many different kinds of *NIPBL* gene mutations have been reported; most lead to the production of an abnormally short (truncated), nonfunctional version of the delangin protein from one copy of the gene in each cell. These mutations reduce the overall amount of delangin produced in cells, which likely alters the activity of the cohesin complex and impairs its ability to regulate genes that are critical for normal development. Although researchers do not fully understand how these changes cause Cornelia de Lange syndrome, they suspect that altered gene regulation probably underlies many of the developmental problems characteristic of the condition. Studies suggest that mutations leading to a nonfunctional version of delangin tend to cause more severe signs and symptoms than mutations that result in a partially functional version of the protein.

Chromosomal Location

Cytogenetic Location: 5p13.2, which is the short (p) arm of chromosome 5 at position 13.2

Molecular Location: base pairs 36,876,759 to 37,065,819 on chromosome 5 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- CDLS
- IDN3
- IDN3-B
- NIPBL_HUMAN
- Nipped-B homolog (*Drosophila*)
- Nipped-B-like
- Scc2

Additional Information & Resources

Educational Resources

- Molecular Biology of the Cell (fourth edition, 2002): Cohesins and Condensins Help Configure Replicated Chromosomes for Segregation
<https://www.ncbi.nlm.nih.gov/books/NBK26931/#A3334>

GeneReviews

- Cornelia de Lange Syndrome
<https://www.ncbi.nlm.nih.gov/books/NBK1104>

Scientific Articles on PubMed

- PubMed
<https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28NIPBL%5BTI%5D%29+OR+%28delangin%5BTIAB%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D>

OMIM

- NIPPED-B-LIKE
<http://omim.org/entry/608667>

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
http://atlasgeneticsoncology.org/Genes/GC_NIPBL.html
- ClinVar
<https://www.ncbi.nlm.nih.gov/clinvar?term=NIPBL%5Bgene%5D>
- HGNC Gene Symbol Report
http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=28862
- NCBI Gene
<https://www.ncbi.nlm.nih.gov/gene/25836>
- UniProt
<http://www.uniprot.org/uniprot/Q6KC79>

Sources for This Summary

- Borck G, Redon R, Sanlaville D, Rio M, Prieur M, Lyonnet S, Vekemans M, Carter NP, Munnich A, Colleaux L, Cormier-Daire V. NIPBL mutations and genetic heterogeneity in Cornelia de Lange syndrome. *J Med Genet.* 2004 Dec;41(12):e128.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/15591270>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1735640/>
- Cheng YW, Tan CA, Minor A, Arndt K, Wysinger L, Grange DK, Kozel BA, Robin NH, Waggoner D, Fitzpatrick C, Das S, Del Gaudio D. Copy number analysis of NIPBL in a cohort of 510 patients reveals rare copy number variants and a mosaic deletion. *Mol Genet Genomic Med.* 2014 Mar;2(2):115-23. doi: 10.1002/mgg3.48. Epub 2013 Nov 14.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/24689074>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3960053/>
- GeneReview: Cornelia de Lange Syndrome
<https://www.ncbi.nlm.nih.gov/books/NBK1104>

- Gillis LA, McCallum J, Kaur M, DeScipio C, Yaeger D, Mariani A, Kline AD, Li HH, Devoto M, Jackson LG, Krantz ID. NIPBL mutational analysis in 120 individuals with Cornelia de Lange syndrome and evaluation of genotype-phenotype correlations. *Am J Hum Genet.* 2004 Oct;75(4): 610-23. Epub 2004 Aug 18.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/15318302>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1182048/>
- Krantz ID, McCallum J, DeScipio C, Kaur M, Gillis LA, Yaeger D, Jukofsky L, Wasserman N, Bottani A, Morris CA, Nowaczyk MJ, Toriello H, Bamshad MJ, Carey JC, Rappaport E, Kawauchi S, Lander AD, Calof AL, Li HH, Devoto M, Jackson LG. Cornelia de Lange syndrome is caused by mutations in NIPBL, the human homolog of *Drosophila melanogaster* Nipped-B. *Nat Genet.* 2004 Jun;36(6): 631-5. Epub 2004 May 16.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/15146186>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4902017/>
- Mannini L, Cucco F, Quarantotti V, Krantz ID, Musio A. Mutation spectrum and genotype-phenotype correlation in Cornelia de Lange syndrome. *Hum Mutat.* 2013 Dec;34(12):1589-96. doi: 10.1002/humu.22430. Epub 2013 Sep 16. Review.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/24038889>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3880228/>
- Pehlivan D, Hullings M, Carvalho CM, Gonzaga-Jauregui CG, Loy E, Jackson LG, Krantz ID, Deardorff MA, Lupski JR. NIPBL rearrangements in Cornelia de Lange syndrome: evidence for replicative mechanism and genotype-phenotype correlation. *Genet Med.* 2012 Mar;14(3):313-22. doi: 10.1038/gim.2011.13. Epub 2012 Jan 5.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/22241092>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3556738/>
- Tonkin ET, Wang TJ, Lisgo S, Bamshad MJ, Strachan T. NIPBL, encoding a homolog of fungal Scc2-type sister chromatid cohesion proteins and fly Nipped-B, is mutated in Cornelia de Lange syndrome. *Nat Genet.* 2004 Jun;36(6):636-41. Epub 2004 May 16.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/15146185>

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